UNITED STATES PATENT AND TRADEMARK OFFICE

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/665,779	09/19/2003	Daniel J. Scales	A32	6408

36378   7590   08/24/2007
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EXAMINER
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ART UNIT	PAPER NUMBER
2152	

MAIL DATE	DELIVERY MODE
08/24/2007	PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

	Application No.	Applicant(s)
Office Action Summary	10/665,779	SCALES ET AL.
	Examiner	Art Unit	
	Dohm Chankong	2152	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE _3_ MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.
- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
  Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☐ Responsive to communication(s) filed on _____.

2a)☐ This action is **FINAL**.   2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) _1-31_ is/are pending in the application.

    4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) _1-31_ is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

    Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

    Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

    a)☐ All b)☐ Some * c)☐ None of:

      1.☐ Certified copies of the priority documents have been received.

      2.☐ Certified copies of the priority documents have been received in Application No. _____.

      3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

    * See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1)☒ Notice of References Cited (PTO-892)

2)☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)

3)☐ Information Disclosure Statement(s) (PTO/SB/08)
    Paper No(s)/Mail Date _____.

4)☐ Interview Summary (PTO-413)
    Paper No(s)/Mail Date. _____ .

5)☐ Notice of Informal Patent Application

6)☐ Other: _____.

DETAILED ACTION

1>   Claims 1-31 are presented for examination.

2>   This is a non-final rejection.

Claim Rejections - 35 USC § 112

The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

3>   Claims 5 and 8 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

  a.   Claim 5 lacks proper antecedent basis: "the available paths";

  b.   The term "substantially" in claim 8 is a relative term which renders the claim indefinite. The term "substantially" is not defined by the claim, the specification does not provide a standard for ascertaining the requisite degree, and one of ordinary skill in the art would not be reasonably apprised of the scope of the invention. In other words, the term "substantially" renders the claim indefinite because the frequency with which data transfer requests is not clearly defined in the claim.

Claim Rejections - 35 USC § 102

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

4>   Claims 1-7, 11, 14-19, and 22-27 are rejected under 35 U.S.C §102(b) as being anticipated

by Saito, U.S Patent No. 5.257.386.

5>   As to claim 1, Saito discloses a method for responding to a request to transfer data

between a virtual machine (VM) in a virtual computer system and a data storage unit within

a multipath data storage system, the method comprising:

determining multipath routing information related to possible paths over which the

data may be routed [column 3 «lines 46-63» | column 6 «lines 36-42» : determining whether

paths are available];

determining VM-specific information related to the VM in the virtual computer

system [column 3 «lines 51-56» : each VM has a transfer priority];

based on the multipath routing information and the VM-specific information,

deciding whether to route the data transfer request [column 3 «line 67» to column 4 «line 14»

| column 6 «lines 36-46» : decision on whether to route the request based on whether the path

is available and the VM's transfer priority]; and

if a decision is made to route the data transfer request, then, based on the multipath

routing information and the VM-specific information, selecting a path over which to route

the data [column 6 «lines 47-56»].

6>   As to claim 2, Saito discloses the VM-specific information indicates an amount of

disk bandwidth that is allocated to the VM [column 4 «lines 1-11»].

7>   As to claim 3, Saito discloses a decision is made not to route the data transfer request

because routing the data transfer request would cause the VM's allocation of disk bandwidth

to be exceeded [column 4 «lines 1-11» | column 7 «lines 13-52» where : a request is not routed if

the total amount of the request exceeds the limit specified by the VM's transfer priority].

8>   As to claim 4, Saito discloses the VM-specific information indicates the VM's

priority relative to other virtual machines [column 4 «lines 1-11»].

9>   As to claim 5, Saito discloses the multipath routing information indicates the

available paths over which the data may be routed [column 6 «lines 36-42»].

10>   As to claim 6, Saito discloses the multipath routing information further indicates a

pending data transfer load for each of the available paths over which the data may be routed

[column 4 «lines 21-34» | column 6 «lines 23-35» where : Saito discloses waiting for pending

data transfer requests to be satisfied from a queue].

11>   As to claim 7, Saito discloses a load distribution function, based on the multipath

routing information and the VM-specific information, is used in selecting a path over which

to route the data [column 4 «lines 48-68» | column 8 «lines 58-62» where : the load on the

paths is distributed between the VMs because each VM is assigned a specific data limit and then must reenter the queue before being able to transfer more data. The load is therefore distributed between the VMs based on the path's availability and the VM's transfer priority].

12>   As to claim 11, Saito discloses if a decision is made not to route the data transfer request, the data transfer request is placed on a queue for routing at a later time [column 7 «lines 18-26»].

13>   As to claim 14, Saito discloses a computer program embodied in a tangible medium, the computer program executing a virtual computer system in support of a plurality of VMs, the virtual computer system having access to a multipath data storage system, the computer program comprising:

a resource manager for sharing system resources between the plurality of VMs [Figure 1 «item 13» where : the queuing manager provides sharing of the paths between the VMs]; and

a storage path manager for routing data between the plurality of VMs and the data storage system, over the multiple data paths [Figure 1 | Figure 4 «item 22, 23»],

wherein the computer program determines VM-specific information and multipath routing information and the storage path manager makes multipath routing decisions based both the VM-specific information and the multipath routing information [column 3 «line 67» to column 4 «line 14» | column 6 «lines 36-56»].

14>   As to claim 15, Saito discloses the VM-specific information and the multipath routing information are used together when making decisions regarding the sharing of system resources [column 4 «lines 1-11» | column 7 «lines 13-52»].

15>   As to claim 16, Saito discloses the decisions regarding the sharing of system resources are based on a proportional share approach [column 4 «lines 1-11» where : each VM has a proportional share of the resources based on the data transfer limit].

16>   As to claim 17, Saito discloses a VM manager for controlling the general operation of the plurality of VMs [Figure 7 «item 23» | column 8 «lines 20-28» where : the controller manages the data transfer operations of the VM].

17>   As to claim 18, Saito discloses a the VM-specific information and the multipath routing information are used together when making decisions regarding the management of the plurality of VMs [column 8 «lines 20-39» : where the controller manages the queue and transfer operations of the VM].

18>   As to claim 19, Saito discloses the VM manager and the resource manager are both implemented in a single software unit [Figure 1 «item 12»].

19>   As to claim 22, Saito discloses a method for selecting a path to be used for data transfer between a VM within a virtual computer system and a storage unit within a multipath data storage system, the virtual computer system comprising a plurality of VMs, the method comprising:

determining which VM within the virtual computer system is involved in the data transfer [column 6 «lines 34-35 and 43-46»];

determining a plurality of available paths over which the data may be routed [column 6 «lines 36-42»];

based on the particular VM involved in the data transfer and the available paths over which the data may be routed, selecting a path over which to route the data [column 6 «lines 47-56»].

20>   As to claim 23, Saito discloses the selection of a path over which to route the data is further based on information regarding data loads over which the data may be routed [column 3 «line 67» to column 4 «line 11» | column 6 «lines 8-22» : decision based in part on the queued requests].

21>   As to claim 24, Saito discloses the selection of a path over which to route the data is further based on relative priorities for the plurality of VMs [column 4 «lines 1-11»].

22>   As to claim 25, Saito discloses the selection of a path over which to route the data is

further based on system resource allocations for the plurality of VMs [column 4 «lines 1-11»

where : the priority determines the allocated data limits for each VM].

23>   As to claims 26 and 27, Saito discloses selection of a path over which to route the data

is based on a load distribution algorithm [column 4 «lines 48-68» | column 8 «lines 58-62»

where : the load on the paths is distributed between the VMs because each VM is assigned a

specific data limit and then must reenter the queue before being able to transfer more data.

The load is therefore distributed between the VMs based on the path's availability and the

VM's transfer priority], where the algorithm is a load balancing algorithm [column 4 «lines

48-68» | column 8 «lines 58-62» where : the load between the VMs is balanced based on their

priorities].

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all

obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in
> section 102 of this title, if the differences between the subject matter sought to be patented and the prior art
> are such that the subject matter as a whole would have been obvious at the time the invention was made to a
> person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be
> negatived by the manner in which the invention was made.

24>   Claims 8, 28, and 29 are rejected under 35 U.S.C §103(a) as being unpatentable over

Saito, in view of Uchino, U.S Patent No. 5.572.694..

25>   As to claim 8, Saito does not expressly disclose a first VM's requests are routed over a

first data path as long as the first data path is available, and a second VM's requests are

routed over a second data path as long as the second data path is available.

Uchino remedies this deficiency. Uchino is directed towards input/output control

method for a virtual machine system [column 1 «lines 10-18»]. Uchino expressly discloses

that allocating a first path to a first VM and a second path to a second VM [Figure 6 |

column 8 «lines 19-28»]. It would have obvious to one of ordinary skill in the art to have

incorporated Uchino's teachings into Saito's virtual machine system in order to provide

Uchino's path allocation functionality. One would have been motivated to modify Saito

because Uchino discloses that the ability to assign access paths to virtual machines enables

easier access to input/output storage devices [column 5 «lines 60-65»].

26>   As to claim 28, it does not teach or further define over the limitations of claims 1 and

8, supra. Therefore, claim 28 is rejected for at least the same reasons set forth for claims 1 and

8.

27>   As to claim 29, Saito discloses the one or more data storage units are connected

directly to the virtual computer system [Figure 1].

28>   Claims 9 and 10 are rejected under 35 U.S.C §103(a) as being unpatentable over Saito in

view of van Rietschote et al, U.S Patent No. 7.093.086 ["Van Rietschote"].

29>   As to claims 9 and 10, Saito does not expressly disclose indicating whether a failure is occurring on one of the paths over which the data could otherwise have been routed, and where the VM is temporarily suspended if a failover is occurring on one of the paths.

Van Rietschote remedies this deficiency. Van Rietschote discloses detecting a failure occurring on one of the paths, and where the VM is temporarily suspended if a failover occurs on one of the paths [column 1 «lines 13-25» | column 4 «lines 18-35» where : van Rietschote detects whether a computer system on the network path has failed. The computer system failing is analogous to a failure occurring on one of the paths because the computer system is on the network path].

It would have been obvious to one of ordinary skill in the art to incorporate Van Rietshote's teachings into Saito's virtual machine system. One would have been motivated to modify Saito to include the suspension and detection functionality taught by Van Rietschote in order to provide disaster recovery capability into Saito's system.

30>   Claims 12, 13 and 21 are rejected under 35 U.S.C §103(a) as being unpatentable over Saito, in view of van Rietschote et al, U.S Patent No. 7.203.944 ["Rietschote"].

31>   As to claims 12 and 13, Saito does not expressly disclose if a decision is made not to route the data transfer request, a further decision is made whether to suspend or migrate the VM. Rietschote remedies this deficiency. Rietschote is directed to balancing loads on computer systems that execute a plurality of virtual machines [column 2 «lines 12-15»].

Rietschote expressly discloses either migrating or suspending a VM from a first computer system to a second computer system if the first is unable to handle the load from the VM [column 2 «lines 12-24» | column 6 «lines 12-16» | column 7 «lines 4-22»], based on several factors including whether or not the system can handle the I/O (data transfer) requests from the VM [column 5 «lines 4-16»]. It would have been obvious to one of ordinary skill in the art to have incorporated Rietschote's suspend and migrate functionality into Saito's virtual machine system. One would have been motivated to modify Saito with such functionality in order to increase the fault tolerance and load balancing capabilities of Saito's virtual machine system, as described by Rietschote.

32>　　　As to claim 21, Saito does not expressly disclose a storage virtualizer. Rietschote discloses a storage virtualizer for presenting one or more portions of the data storage system to one or more of the VMs as one or more virtual disk drives [Figure 2 «item 34»] as well as a VM manager and resource manager [Figure 1 «items 38 and 48»]. It would have been obvious to one of ordinary skill in the art to incorporate Rietschote's storage virtualizer into Saito's virtual machine system. One would have been motivated to modify Saito to obtain the benefits of a storage virtualizer, including providing a link from the virtual disk drives to the VMs [see Rietschote, column 5 «line 63» to column 6 «line 17»].

33>　　　Claim 20 is rejected under 35 U.S.C §103(a) as being unpatentable over Saito.

34>   Saito does not expressly disclose a kernel but does disclose that the VM manager, the

resource manager and the storage path manager are integrated together within a virtual

machine monitor [Figures 1 and 7]. Saito's virtual machine monitor is analogous in

functionality to the claimed kernel.

35>   Claims 30 and 31 are rejected under 35 U.S.C §103(a) as being unpatentable over Saito

and Uchino, in further view of Rietschote.

36>   As to claims 30 and 31, Saito does not expressly disclose the one or more data storage

units are connected to the virtual computer system through a network, where the network is

a storage area network. In a similar system, Rietschote does disclose one or more data storage

units are connected to the virtual computer system through a network, where the network is

a storage area network [Figure 1 | column 1 «lines 18-21»].

     It would have been obvious to one of ordinary skill in the art to incorporate

Rietschote's teachings of a storage area network into Saito's virtual machine system. One

would have been motivated to modify Saito in order to update its system to be compatible

with different networks and technologies as taught by Rietschote.

Conclusion

     The prior art made of record and not relied upon is considered pertinent to applicant's

disclosure:

     Videki, II, U.S Patent No. 4.396.984;

Jagannathan et al, U.S Patent No. 5.692.193;

Flynn, Jr., U.S Patent No. 6.453.392;

Albert et al, U.S Patent No. 6.970.913;
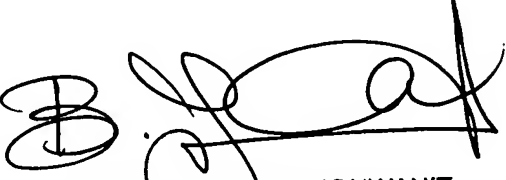
van Rietschote, U.S Patent No. 7.213.246.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Dohm Chankong whose telephone number is 571.272.3942. The examiner can normally be reached on Monday-Friday [8:30 AM to 4:30 PM].

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Bunjob Jaroenchonwanit can be reached on 571.272.3913. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

DC

BUNJOB JAROENCHONWANIT
SUPERVISORY PATENT EXAMINER

8/19/17